11-15-00

A

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No: 27600/M209A

PATENT APPLICATION TRANSMITTAL UNDER 37 C.F.R. 1.53

Box Patent Application
Commissioner for Patents
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): Joyce B. Carson

Title: Method of Calibrating an Engraving Machine

1. Type of Application

☒ This is a new application for a

☒ utility patent.

☐ design patent.

☐ This is a continuation-in-part application of prior application no.

2. Application Papers Enclosed

1 Title Page

8 Pages of Specification (excluding Claims, Abstract, Drawings & Sequence Listing)

5 Page(s) of Claims

1 Page(s) of Abstract

3 Sheet(s) of Drawings (Figs. 1 to 3)

☒ Formal

☐ Informal

Page(s) of Sequence Listing

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this Patent Application Transmittal and the documents referred to as enclosed therewith are being deposited with the United States Postal Service on **November 14, 2000**, in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231 utilizing the "Express Mail Post Office to Addressee" service of the United States Postal Service under Mailing Label No. EM578442818US.

Richard Zimmermann

3. **Declaration or Oath**

☒ Enclosed

☒ Executed by (check all applicable boxes)

☒ Inventor(s)

☐ Legal representative of inventor(s) (37 CFR 1.42 or 1.43)

☐ Joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached

☐ The petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 are enclosed. See Item 5D below for fee.

☐ Not enclosed - the undersigned attorney or agent is authorized to file this application on behalf of the applicant(s). An executed declaration will follow.

4. **Small Entity Status**

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A small entity statement is(are) attached.

5. **Additional Papers Enclosed**

☐ Preliminary Amendment

☐ Information Disclosure Statement

☐ Declaration of Biological Deposit

☐ Computer readable copy of sequence listing containing nucleotide and/or amino acid sequence

☐ Microfiche computer program

☐ Associate Power of Attorney

☐ Verified translation of a non-English patent application

☐ An assignment of the invention

☒ Return receipt postcard

☐ Other

6. **Priority Applications Under 35 USC 119**

Certified copies of applications from which priority under 35 USC 119 is claimed are listed below and

☐ are attached.

☐ will follow.

COUNTRY	APPLICATION NO.	FILED

7. Filing Fee Calculation (37 CFR 1.16)

A. ☒ **Utility Application**

CLAIMS AS FILED - INCLUDING PRELIMINARY AMENDMENT (IF ANY)						
			SMALL ENTITY		OTHER THAN A SMALL ENTITY	
	NO. FILED	NO. EXTRA	RATE	FEE	RATE	FEE
BASIC FEE				$355.00		$710.00
TOTAL	15 -20	= 0	X 9 =	$	X 18 =	$
INDEP.	3 - 3	= 0	X 40 =	$	X 80 =	$
☐ First Presentation of Multiple Dependent Claim			+ 135 =	$	+ 270 =	$710.00
			Filing Fee:	$	**OR**	$710.00

B. ☐ **Design Application ($160.00/$320.00)** Filing Fee: $ _____

C. ☐ **Plant Application ($245.00/$490.00)** Filing Fee: $ _____

D. Other Fees

☐ Recording Assignment [Fee -- **$40.00** per assignment] $ _____

☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached [Fee -- **$130.00**] $ _____

☐ Other $ _____

Total Fees Enclosed **$710.00**

8. **Method of Payment of Fees**

☒	Enclosed check in the amount of:	$710.00
☐	Charge Deposit Account No. 13-2855 in the amount of: A copy of this Transmittal is enclosed.	$_____
☐	Not enclosed	

9. **Deposit Account and Refund Authorization**

The Commissioner is hereby authorized to charge any deficiency in the amount enclosed or any additional fees which may be required during the pendency of this application under 37 CFR 1.16 or 37 CFR 1.17 or under other applicable rules (except payment of issue fees), to Deposit Account No. 13-2855. A copy of this Transmittal is enclosed.

Please refund any overpayment to Marshall, O'Toole, Gerstein, Murray & Borun at the address below.

10. **Correspondence Address**

Customer No.: 04743

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November 14, 2000

SOLE INVENTOR

"EXPRESS MAIL"
Mailing label No. EM578442818US.
Date of Deposit: November 14, 2000
I hereby certify that this paper (or fee) is being deposited with the United States Postal Service "EXPRESS MAIL POST OFFICE TO ADDRESSEE" service under 37 CFR §1.10 on the date indicated above and is addressed to: Commissioner for Patents, Washington, D.C. 20231

Richard Zimmermannn

APPLICATION FOR
UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that I, Joyce B. Carson a citizen of the United States, residing at 195 Pearl Lane, Campobello, (29322) in the County of Spartanburg and State of South Carolina have invented a new and useful METHOD OF CALIBRATING AN ENGRAVING MACHINE, of which the following is a specification.

METHOD OF CALIBRATING AN ENGRAVING MACHINE

TECHNICAL FIELD

The present invention relates generally to a method of calibrating an engraving machine and more particularly to an engraver calibration method using a non-contact optical profiler.

BACKGROUND ART

Gravure printing is an intaglio process employing one or more engraved gravure printing cylinders. Image areas of each cylinder are engraved by an engraving head of an engraving machine to create cells. The cells vary in volume corresponding to the tonal values in the images.

The quality of the final printed product depends upon engraving the correct cell sizes on the cylinder. The shape and volume of each cell dictates how much ink that cell will hold and correspondingly, how an ink dot will appear in print. Even small variations in cell size can produce changes in dot size noticeable to the human eye. It has been shown in testing that the actual cell volume is more representative of the actual print density than the surface area of the cell. Therefore, it is necessary to calibrate the engraver so that accurate and repeatable cell volumes can be produced.

Past attempts to accurately calibrate an engraver have included the use of precision optical instruments to measure various spatial parameters of the cells in order to estimate actual cell volume. This technique is detailed in Wouch et. al. U.S. Pat. No. 5,293,426 assigned to the assignee of the present application. As detailed in such patent, an optical microscope is used to measure the length and width of the surface of a plurality of test cells. From such measurements, the depth, face area, and volume per unit area of each test cell may be estimated. Using statistical analysis, the average cell width, length, depth, face area, and volume per unit area are calculated. The average cell width, area, or volume per unit area is then compared with a predetermined standard value to compute any variance and to adjust the engraving head accordingly.

Non-contact optical profilers, such as the WYKO Rollscope, a vertical scanning interference microscope, have previously been used to characterize the surface roughness of such products as rubber, paper, ceramics, textured steel and aluminum, adhesives, films, and others. The WYKO Rollscope has also been used to characterize cells formed in anilox rolls used in flexographic reproduction. Each of these applications is characterized by relatively uniform depth, shape, volume and density of surface deformations.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, a method of calibrating a gravure engraving machine which engraves images on a printed member such as a gravure printing cylinder includes the steps of providing an engraving signal of a predetermined waveshape to the engraving machine to cause the engraving machine to produce a gravure cell having a volume and measuring the value of the gravure cell using a non-contact optical profiler. The measured volume is compared with a predetermined cell volume to obtain a variance indication and the engraving machine is adjusted according to the variance indication.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will become more apparent from a detailed consideration of the invention taken in conjunction with the drawings in which:

Fig. 1 is a block diagram of a printing cylinder engraver system utilizing the method of the present invention;

Fig. 2 is a flow chart of steps undertaken to produce printed copy; and

Fig. 3 is a flow chart of steps taken in accordance with the calibration step illustrated in Fig. 2 according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to electromechanical engraving of gravure printing cylinders, and more specifically, to a method of calibrating an engraving machine used to engrave gravure cylinders or other intaglio printing cylinders.

Referring to Fig. 1, a gravure engraving system 10 includes a computer 12, which processes image densities or other optical parameters recorded by one or more reading heads 13 or stored in a data file, and an engraving machine 14, which receives electrical signals developed by the computer 12. The engraving machine 14 includes one or more engraving heads 15 having a diamond engraving stylus that engraves gravure cells in a copper cylinder in accordance with the electrical signals. The gravure cells are typically engraved at a speed of 3600 to 8000 cells per second. The engraving machine 14 further includes one or more resistance potentiometers 17 which control the penetration depth of the engraving heads 15, and thus the cell volume, by varying the electrical waveshape supplied to the engraving heads 15.

Prior to performing a production engraving process, the engraving system 10 must be calibrated. To accomplish this calibration, one or more test cells 18 are engraved in a cylinder using gravure engraving machine 14. A well-known gravure engraving machine 14 is a Helio-Klischograph engraving machine manufactured by Dr. Ing. Rudolf Hell GmbH.

As noted in greater detail hereinafter, the gravure engraving machine 14 is operated such that the diamond stylus cuts into the copper surface of the gravure printing cylinder 16 to form one or more test cells 18 in the general shape of an inverted pyramid. Although the test cell 18 is depicted as having an inverted diamond shape, those skilled in the art will appreciate that the shape of the test cell 18 will vary depending on a number of factors, including, for example, diamond stylus wear, gravure printing cylinder 16 rotation speed, and the electrical waveshape supplied to the engraving head(s) 15. The inverted pyramid shape, however, ensures consistent and excellent ink release even when printing on smooth and non-porous surfaces.

It is known that two gravure cells with the same spatial measurements of surface width and length, but cut with different diamond styli, can have different cell volumes. Testing has shown that the volume of a cell primarily dictates how the human eye perceives the optical density of the color printed by the cell. Even small variations in cell volume can produce large changes in the perceived color. Therefore, to effectively calibrate a gravure engraving machine 14, it is necessary to accurately correlate the actual volume of the test cells 18 produced by the machine 14 to the waveshape(s) used to produce the test cells 18.

One embodiment utilizes a non-contact optical profiler 20, such as the WYKO® RollScope (a vertical scanning interference microscope manufactured by Veeco Instruments, Inc., Plainview, New York), to provide a fast, highly accurate measurement of gravure cell volume in order to permit calibration of an engraving machine.

A method of producing one or more gravure print cylinder(s) 16 for printing is set forth in the flow diagram illustrated in FIG. 2. Upon starting the production printing process, the gravure engraving machine 14 is calibrated at a step 200, described in greater detail in FIG. 3 below. After calibrating the gravure engraving machine 14, a gravure cylinder 16 is placed in the gravure engraving machine 14 and is engraved at a step 202. The engraving process 202 includes the steps of providing data representing a desired image to the computer 12, causing the computer 12 to convert the image to electrical waveforms of predetermined amplitude and pulse width, and transmitting the electrical waveforms to the gravure engraving machine 14. It should be noted that although the computer 12 is depicted as a single element in FIG. 1, it may, in practice, consist of multiple computers or central processing units which are interconnected together, for example, by a network. Also, a driver circuit which develops waveforms of appropriate magnitude and waveshape may be coupled between the computer 12 and the engraving machine 14.

Continuing with FIG. 2, once the engraving process 202 begins, a step 204 periodically determines whether the engraving process 202 is complete. If the

engraving process 202 is not complete, a step 206 determines if recalibration of the gravure engraving machine 14 is necessary. The step 206 may use such factors as the last time the gravure engraving machine 14 was calibrated, the potential wear on the diamond engraving styli, the desired image quality, and other factors. If the step 206 determines that recalibration is not necessary, the engraving process 202 continues. If, however, the step 206 determines that recalibration is necessary, the calibration step 200 is reinitiated.

Returning to the step 204, if it is determined that the engraving process 202 is complete, a step 208 determines whether there are more cylinders to be engraved. If so, a new gravure cylinder 16 is loaded into the engraving machine and the process returns to the step 206. On the other hand, if there are no more cylinders to be engraved, the completed gravure cylinder(s) 16 are utilized at a step 210 to print copy.

Turning to FIG. 3, there is shown in detail the method of calibration utilized by the step 200 according to the present embodiment. The process begins at a step 300 by determining the ink color the gravure cylinder 16 will print (for example, cyan, yellow, magenta, or black), and by determining the type of engraving stylus used by the gravure engraving machine 14 to engrave the gravure cylinder 16 (for example, a 140°, 130°, or 110° stylus). Following the step 300, at least one predetermined cell volume is established at a step 302 based upon the ink color and the stylus type determined at the step 300. It should be noted that the establishment of the predetermined cell volume need not be based on the variables of ink color and stylus type, but may be based on one or more other factors, including paper quality, paper roughness, batch variations in ink and papers, and stylus wear. Once the predetermined volume is established at the step 302, the gravure engraving machine 14 is operated at a step 304 to produce at least one gravure test cell associated with each predetermined cell volume. The step 304 is undertaken by causing the computer 12 to provide a waveform for each test cell having an amplitude and/or pulse width that nominally should produce a cell having the predetermined cell volume.

In the present embodiment, three linear rows of gravure test cells 18 are preferably (although not necessarily) produced as a test array in the gravure cylinder 16 at the step 304. Also preferably, each row includes approximately 70 test cells 18. The test cells 18 are produced with a cell volume which corresponds to a midtone tonal value (i.e., an optical density of approximately 0.48). It will be appreciated by those skilled in the art, however, that the tonal value chosen may range anywhere from a light highlight tone to a shadow tone, and may not be limited to a single tonal value.

After the production of the gravure test cells 18, the volumes of the gravure test cells are measured at a step 308. It has been determined, however, that a more accurate measurement at the step 308 may be obtained by optionally cleaning the gravure test cells 18 first, as noted at a step 306. In the preferred embodiment, the gravure test cells 18 are cleaned at the step 306 by the application of an antiperspirant sold under the trademark Degree® by Helene Curtis, Inc., of Chicago, Illinois (which includes the constituent aluminum sesquichlorohydrate). While it is not completely understood why the application of this cleaning agent has an effect upon the measurement of the gravure cell volume, two hypotheses have been considered. The first hypothesis is that the engraving process creates debris within the test cells 18 and the cleaning agent applied to the cells 18 washes away the debris. The second hypothesis is that the cleaning agent creates a more reflective surface that is more conducive to measurement.

After the gravure test cells 18 have been cleaned at the step 306, or directly following the engraving step 304, the gravure test cell volumes are measured at the step 308 by the optical profiler 20. The optical profiler 20 is capable of being equipped with various objective lenses which determine the number of test cells 18 measured at the step 308. For example, a 20 obj. lens will typically measure between three and five test cells, a 40 obj. lens two or three test cells, while a 50 obj. lens will typically measure one cell.

In the present embodiment, a test cell location is selected from the second or third rows of the three linear rows of test cells 18. Typically the fifth test cell from the

leftmost test cell of the second or third row from the top of the test cell array is chosen. The optical profiler 20 is fitted with a 20 obj. lens and is adjusted to target a subset of the test cells including the chosen test cell. The optical profiler 20 displays a visual depiction of the targeted test cells 18 and is adjusted so that as many complete test cells 18 as possible are within the scanning region of the optical profiler 20. For example, the scanning region of a 20 obj. lens targeting the fifth test cell 18 in the second linear row may contain the fifth and sixth cells of both the second and third linear rows (i.e., four cells in a two by two pattern).

Regardless of the objective lens chosen, the optical profiler 20 scans the test cells 18 and calculates various measurements, each of which is a highly accurate, non-contact, three-dimensional volumetric measurement of each test cell 18. The optical profiler 20 provides measurements of the X, Y, and Z (length, width and depth) spatial dimensions, as well as the volume of each test cells 18. The optical profiler 20 also provides a statistical average of each measurement (i.e., length, width, depth, and volume) over the multiple cells, as well as maximum and minimum values for each dimensional measurement for all of the cells taken as a group.

Once the measurements are obtained, the maximum and minimum volumetric measurements for the target cells are first analyzed for a variance at a step 310. A step 312 then determines whether the variance between the maximum and minimum volumes of the test cells is greater than a desired threshold, for example 2 μm^3. If the variance is greater than the desired threshold, the measurement step 308 is repeated, using either with the same target cells or other target cells in the existing test cell array. Alternatively, after an appropriate number of failed attempts (for example, three) at obtaining a suitable volumetric variance, the step 304 may be repeated to obtain a new test cell array, which is thereafter analyzed at the steps 308, 310 and 312 as noted above.

It will be further appreciated by those skilled in the art that if the optical profiler 20 is fitted with an objective lens that measures only one test cell 18, the steps 310 and 312 will not be necessary and can be omitted.

Once an acceptable maximum and minimum volumetric variance is obtained, a comparison is performed at a step 314 between the measured average test cell volume determined at the step 308 and the predetermined cell volume from the step 302. A step 316 then determines if the variance between the average volume of the test cells 18 and the predetermined volume is less than a desired threshold value (i.e., the step 316 determines whether the variance is within acceptable limits), for example 1 μm^3. If the step 316 determines the gravure engraving machine 14 is calibrated within acceptable limits, the calibration step 200 is terminated, otherwise, the gravure engraving machine 14 may be adjusted at a step 318.

To adjust the gravure engraving machine 14, the resistance potentiometer(s) 17 is (are) manipulated to change the electrical waveshape supplied to the engraving head(s) 15 in accordance with the average volume variance calculated at the step 314. Upon completion of the step 318, the calibration may preferably return to the step 304 to produce new gravure test cells 18 for calibration verification, or alternatively, the calibration step 200 may end.

While the present invention has been described with reference to specific examples, which are intended to be illustrative only and not to be limiting of the invention, it will be apparent to those of ordinary skill in the art that changes, additions or deletions may be made to the disclosed embodiments without departing from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A method of calibrating a gravure engraving machine, the method comprising the steps of:

providing an engraving signal of a predetermined waveshape to the engraving machine to cause the engraving machine to produce a gravure cell having a volume;

measuring the volume of the gravure cell using a non-contact optical profiler;

comparing the measured volume of the gravure cell to a predetermined cell volume to obtain a variance indication; and

adjusting the engraving machine in accordance with the variance indication.

2. The method of claim 1, wherein the step of adjusting the engraving machine further comprises the step of tuning a resistance potentiometer to vary the predetermined waveshape.

3. The method of claim 1, wherein the gravure engraving machine engraves a cylinder for a particular ink color and wherein the step of comparing the measured volume of the gravure cell further comprises the step of selecting the predetermined cell volume in dependence upon the particular ink color.

4. The method of claim 1, wherein the gravure engraving machine engraves a cylinder with a particular engraving stylus and wherein the step of comparing the measured volume of the gravure cell further comprises the step of selecting the predetermined cell volume in dependence upon the particular engraving stylus.

5. The method of claim 1, wherein the calibration is undertaken at a number of times during an engraving procedure.

6. The method of claim 1, wherein the non-contact optical profiler is an optical vertical scanning interferometer microscope.

7. A method of calibrating a gravure engraving machine, the method comprising the steps of:

providing an engraving signal of a predetermined waveshape to the engraving machine to cause the engraving machine to produce a gravure cell having a volume;

cleaning the gravure cell;

measuring the volume of the gravure cell using a non-contact optical profiler;

comparing the measured volume of the gravure cell to a predetermined cell volume to produce a comparison variance; and

adjusting the engraving machine in accordance with the comparison variance.

8. The method of claim 7, wherein the step of cleaning the gravure cell includes the application of aluminum sesquichlorohydrate to the surface of the gravure cell.

9. The method of claim 7, wherein the step of adjusting the engraving machine further comprises the step of tuning a resistance potentiometer to vary the predetermined waveshape.

10. The method of claim 7, wherein the gravure engraving machine engraves a cylinder for a particular ink color and wherein the step of comparing the measured volume of the gravure cell further comprises the step of selecting the predetermined cell volume in dependence upon the particular ink color.

11. The method of claim 7, wherein the gravure engraving machine engraves a cylinder with a particular engraving stylus and wherein the step of comparing the measured volume of the gravure cell further comprises the step of selecting the predetermined cell volume in dependence upon the particular engraving stylus.

12. The method of claim 7, wherein the calibration is undertaken at a number of times during an engraving procedure.

13. The method of claim 7, wherein the non-contact optical profiler is an optical vertical scanning interferometer microscope.

14. A method of calibrating a gravure engraving machine, the method comprising the steps of:

(a) providing a number of engraving signals each of a predetermined waveshape to the engraving machine to cause the engraving machine to produce at least a plurality of gravure cells each having a volume;

(b) measuring the volume of each of the plurality of gravure cells using a non-contact optical profiler to obtain a maximum volume, a minimum volume, and an average volume for the plurality of gravure cells;

(c) comparing the measured maximum and minimum volumes of the gravure cells to obtain a volume variance;

(d) repeating steps (b) and (c) if the volume variance is greater than a first threshold value;

(e) comparing the measured average volume for the plurality of gravure cells to a predetermined cell volume to obtain an average volume variance if the volume variance is less than the first threshold value; and

(f) adjusting the engraving machine in accordance with the average volume variance if the average volume variance is below a second threshold.

15. The method of claim 14, wherein step (d) is undertaken a maximum of three times, and including the further step of repeating step (a), if the volume variance is greater than the first threshold value after the third time that the step (d) has be undertaken, to produce a further plurality of gravure cells and repeating steps (b) through (f) upon the new plurality of gravure cells.

METHOD OF CALIBRATING AN ENGRAVING MACHINE

ABSTRACT OF THE INVENTION

A method of calibrating a gravure engraving machine includes the steps of providing an engraving signal to the engraving machine to cause production of a cell, measuring the volume of the cell, comparing the measured cell value to a predetermined cell volume and adjusting the engraving cell in accordance with the comparison.

FIG. 1

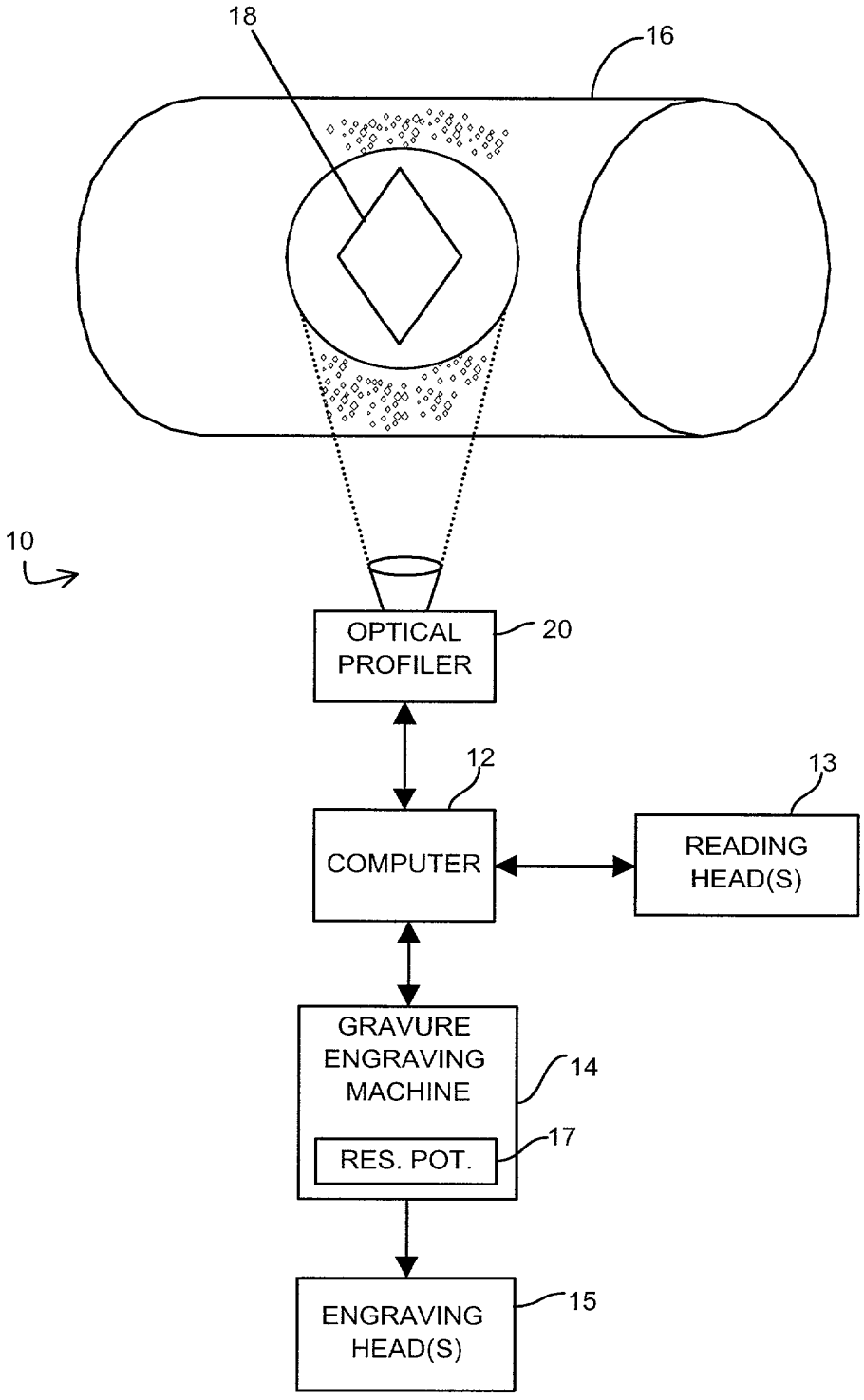

18
16
10
OPTICAL PROFILER
20
12
13
COMPUTER
READING HEAD(S)
GRAVURE ENGRAVING MACHINE
14
RES. POT.
17
ENGRAVING HEAD(S)
15

FIG. 2

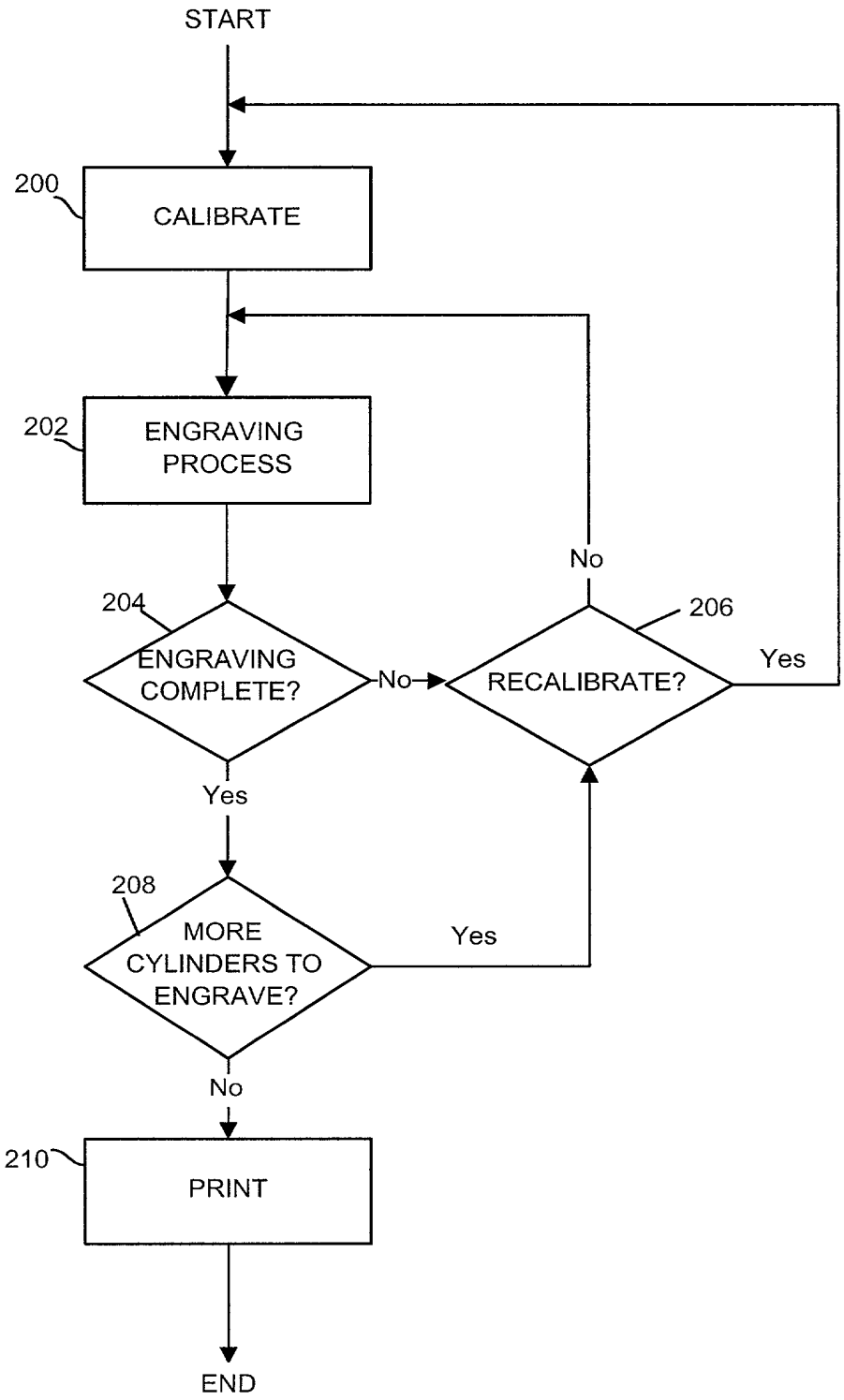
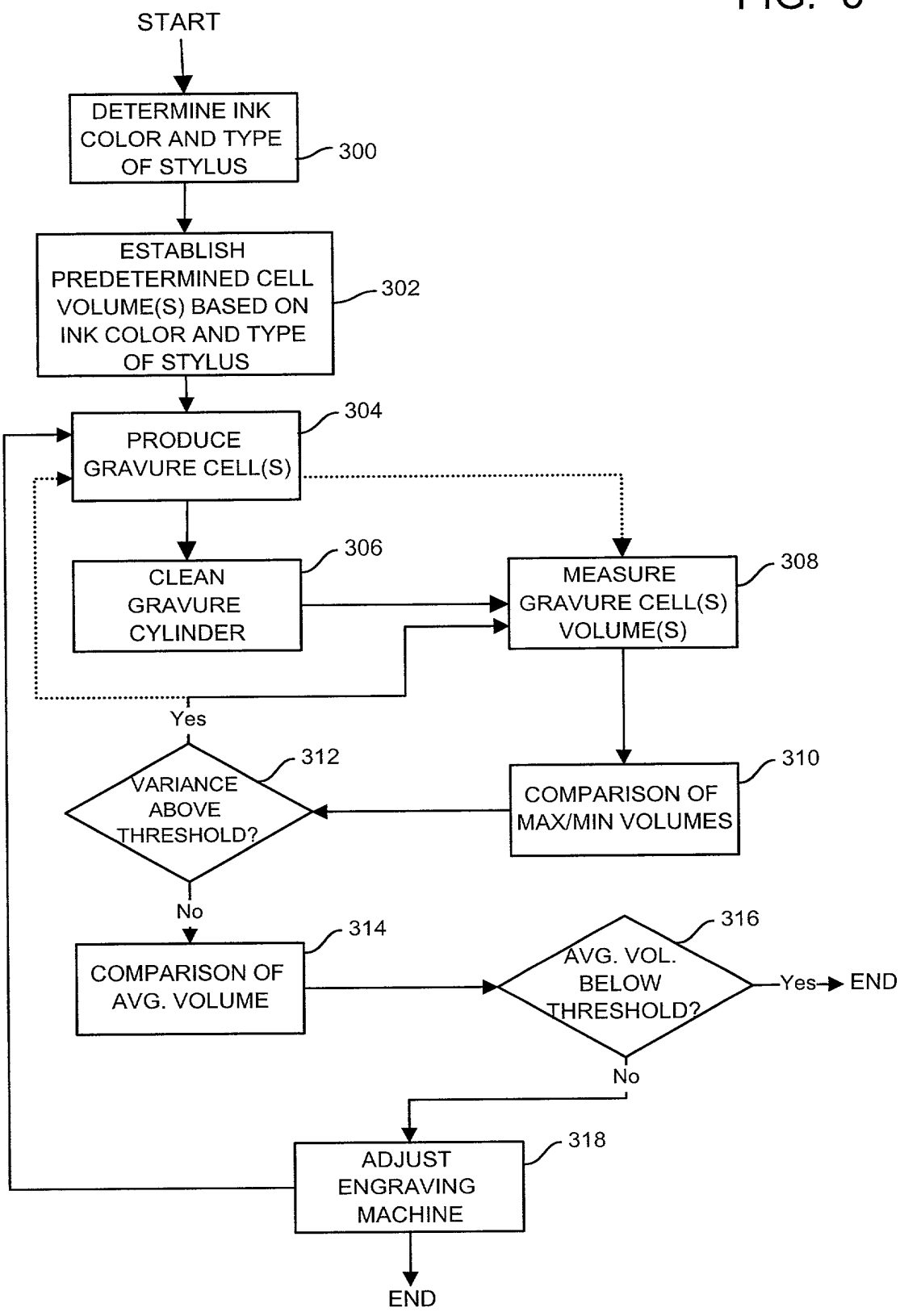

START
200
CALIBRATE
202
ENGRAVING PROCESS
204
ENGRAVING COMPLETE?
No
206
RECALIBRATE?
No
Yes
Yes
208
MORE CYLINDERS TO ENGRAVE?
Yes
No
210
PRINT
END

FIG. 3


START
DETERMINE INK COLOR AND TYPE OF STYLUS
300
ESTABLISH PREDETERMINED CELL VOLUME(S) BASED ON INK COLOR AND TYPE OF STYLUS
302
PRODUCE GRAVURE CELL(S)
304
CLEAN GRAVURE CYLINDER
306
MEASURE GRAVURE CELL(S) VOLUME(S)
308
Yes
VARIANCE ABOVE THRESHOLD?
312
COMPARISON OF MAX/MIN VOLUMES
310
No
COMPARISON OF AVG. VOLUME
314
AVG. VOL. BELOW THRESHOLD?
316
Yes
END
No
ADJUST ENGRAVING MACHINE
318
END

DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "**METHOD OF CALIBRATING AN ENGRAVING MACHINE**," the specification of which (check one): ☒ is attached hereto; ☐ was filed on _____ as Application Serial No. _____ and was amended on _____ _____ (if applicable); ☐ was filed as PCT International Application No. _____ on _____ and was amended under Article 19 on _____ (if applicable). I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

(Application Serial Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed ☐ Yes	☐ No
(Application Serial Number)	(Country)	(Day/Month/Year Filed)	☐ Yes	☐ No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

(Application Serial Number)	(Day/Month/Year Filed)
(Application Serial Number)	(Day/Month/Year Filed)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 C.F.R. §1.56 which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

(Application Serial Number)	(Day/Month/Year Filed)	(Status-Patented, Pending or Abandoned)
(Application Serial Number)	(Day/Month/Year Filed)	(Status-Patented, Pending or Abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I hereby appoint as my attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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Allen H. Gerstein (22,218)
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Edward M. O'Toole (22,477)
Michael F. Borun (25,447)
Trevor B. Joike (25,542)
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Anthony Nimmo (30,920)
Christine A. Dudzik (31,245)
Jeffrey S. Sharp (31,879)
Martin J Hirsch (32,237)
James J. Napoli (32,361)
Richard M. La Barge (32,254)
Li-Hsien Rin-Laures, M.D (33,547)
Douglass C. Hochstetler (33,710)
Robert M. Gerstein (34,824)
David W. Clough (36,107)
James A. Flight (37,622)
Roger A Heppermann (37,641)
David A. Gass (38,153)
Gregory C. Mayer (38,238)

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Date ☒ 11/10/00	Signature ☒ Joyce B. Carson

APPLICABLE RULES AND STATUTES

37 CFR 1.56. DUTY OF DISCLOSURE - INFORMATION MATERIAL TO PATENTABILITY (Applicable Portion)

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and
(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentability defines, to make sure that any material information contained therein is disclosed to the Office.

Information relating to the following factual situations enumerated in 35 USC 102 and 103 may be considered material under 37 CFR 1.56(a).

35 U.S.C. 102. CONDITIONS FOR PATENTABILITY: NOVELTY AND LOSS OF RIGHT TO PATENT

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraph (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

35 U.S.C 103. CONDITIONS FOR PATENTABILITY; NON-OBVIOUS SUBJECT MATTER (Applicable Portion)

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

35 U.S.C. 112. SPECIFICATION (Applicable Portion)

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.